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Configurations of community in flood risk management

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Abstract

Despite a notable increase in the literature on community resilience, the notion of 'community' remains underproblematised. This is evident within flood risk management (FRM) literature, in which the understanding and roles of communities may be acknowledged

but seldom discussed in any detail. The purpose of the article is to demonstrate how community networks are configured by different actors, whose roles and responsibilities span spatial scales within the context of FRM. Accordingly, the authors analyse findings from semi-structured interviews, policy documents, and household surveys from two flood prone areas in Finnish Lapland. The analysis reveals that the ways in which authorities, civil society, and informal actors take on multiple roles are intertwined and form different types of networks. By implication, the configuration of community is fuzzy, elusive and situated, and not confined to a fixed spatiality. The authors discuss the implications of the complex nature of community for FRM specifically, and for community resilience more broadly. They conclude that an analysis of different actors across scales contributes to an understanding of the configuration of community, including community resilience, and how the meaning of community takes shape according to the differing aims of FRM in combination with differing geographical settings.

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Introduction

When linking community resilience to natural hazards or disasters, researchers often examine how communities prepare for, act during, recover from, and mitigate hazards (Cutter 2016; Kruse et al. 2017). Hence, they view resilience as a dynamic process of capacity to deal with hazards, rather than an outcome or a desired stable state (Norris et al. 2008; Kruse et al. 2017; Maclean et al. 2017). In the case of flood risk management (FRM), a processual approach to resilience has involved a shift from technical resistance-based flood protection towards more comprehensive FRM through a combination of different approaches, including land use planning, flood protection structures, and improved disaster preparedness, response and recovery (Dieperink et al. 2016; Bubeck et al. 2017; Hartmann & Driessen 2017). Within the European Union, the Floods Directive (Directive 2007/60/EC) emphasises a diversified approach to managing floods, identifying the need to adapt to floods as well as improved flood defence and disaster preparedness (European Union 2007). The cornerstones of FRM in the Floods Directive are six-year FRM plans in areas of high flood risk, including the development of flood maps (Dieperink et al. 2016; Priest et al. 2016; Hartmann & Driessen 2017).

In essence, enhanced flood resilience can be seen as one strategy and goal of FRM (Morrison et al. 2018). A key to this is to strengthen the ability of communities to prepare for, handle and recover from a flood event, thus highlighting the importance of community resilience (Maskrey et al. 2019; Tyler et al. 2019). Moreover, there have been calls to strengthen community resilience, also in the broader disaster risk management literature (Norris et al. 2008; Kruse et al. 2017).

In community resilience and FRM literature, community is commonly seen as a geographical or administrative level of analysis (e.g. Norris et al. 2008; Magis 2010; Berkes & Ross 2016; Cutter 2016; Giordano et al. 2017; Kruse et al. 2017; Maclean et al. 2017;

Sayers et al. 2018). In that view, community is a place-based concept, often referring to a specific local community. Another well-established approach to community is a networked understanding, within which community is understood as formed through social relations and networks between people (Barrett et al. 2011; Pauwelussen 2016; Misra et al. 2017). However, the concept of community is usually taken for granted in such literature and not thoroughly discussed (Walters 2015; Mulligan et al. 2016; Robinson & Carson 2016).

In the FRM literature conceptualisations of community often refer to residents in a specific location (Coates 2015; Giordano et al. 2017; McEwen et al. 2017), while the most important actors in FRM are public authorities at different levels of administration (Fournier et al. 2016; Priest et al. 2016). To increase the role for community, there have been calls for more participatory FRM approaches whereby more power should be given to local residents and their representatives (i.e. the community) (Moon et al. 2017; Maskrey et al. 2019). We claim that such a shift could also include a more nuanced view of community, one that acknowledges that there are multiple networked actors that contribute to FRM and they could all be understood as part of the community. Therefore, we argue that, in order to analyse community resilience within the context of FRM, the different ways communities are configured by various actors should be examined.

In this article we focus primarily on the networked understanding of community and examine the role of various actors that are central to FRM through a study of two flood prone areas in Finnish Lapland, Kittilä and Rovaniemi. We address the following questions: (1) Who are the key actors involved in FRM in the two study areas? (2) How do the actors understand the concept of community, and how do the actors perceive their own role, as well as the roles of other actors, within FRM and community? (3) How are the borders of the 'community' configured, and does the configuration vary according to differing types of engagement in FRM activities? These research questions do not explicitly link community to

resilience. However, in the Discussion section we discuss the different community configurations and their linkages to resilience.

Conceptualising community

Notwithstanding the long tradition of scholarly engagement in understanding and conceptualising community in other social science literature than community resilience literature (e.g. Hillery 1955), in order to understand the configuration of community in FRM, we need to focus in on important nuances in the two 'hegemonic' understandings (i.e. place-based community and networked community), for four interrelated reasons.

First, several types of community can be distinguished. For example, community can be related to the concept of *local society* (Wilkinson 1991; McManus et al. 2012), which consists of interactions between its members and social structures affecting decision-making and the organisation of daily life. Community, and specifically the Latin word *communitas*, can be seen as the opposite of social structure; *communitas* is an elusive entity related to unstructured forms of human interrelatedness (Turner 1969; Beaumont & Brown 2018), whereas *community field*, which relates to collective action, continuous social interaction and networks, has been seen as uniting a substantial proportion of members of a local society (Wilkinson 1991; McManus et al. 2012).

Second, it has been argued that communities cannot be delineated, neither spatially nor temporally. Ojha et al. (2016) highlight that confining the term community to a single location is misleading, as community actors unavoidably interact with non-local actors. Furthermore, communities are not temporally static entities but may change during the life cycle (i.e. before, during, and after natural hazard events) (Barrios 2014; Misra et al. 2017). Hence, community can be seen as spatially and temporally multilayered, without clear boundaries, and could be formed through place-based face-to-face or communication technology mediated

interactions for example, and take place in imagined settings (Mulligan et al. 2016). In other words, communities and the scale of community may not be stable over time (Barrios 2014; Ojha et al. 2016).

Third, there are multiple processes that continuously affect community formation and development. Agrawal & Gibson (1999) emphasise that there are multiple actors and interests as well as external influences and processes within any community, thereby challenging the often implicit idea that communities are static units within which members share identities and interests. Approaching community as politics makes the term 'community of practice' a relevant notion (Wenger 2000). Communities of practice refer to a specific type of community, wherein different actors share a common passion for their work and interact to develop through their practice. There are three forms of reproduction within such communities (Wenger 2000): *engaging* in common actions, *imagining* shared identity (Anderson 2006), and *aligning* activities toward a shared goal. However, the drivers that construct communities vary according to context, ranging from shared interest to external threats and governance arrangements, and these factors interact with each other (Kuecker et al. 2011). Different types of change drivers may then have distinct impacts on community cohesion and power relationships, and specific actors may become more or less powerful due to the changes (Titz et al. 2018).

Fourth, a community consists of different types of actors. Some authors emphasise that community is configured through interactions between individual actors, such as the people living in a specific location (Coates 2015; McEwen et al. 2017), or between actor networks, which extend beyond geographical areas (Pauwelussen 2016; Misra et al. 2017). Some point out that communities include organisations (Patterson et al. 2010; Barrett et al. 2011; Giordano et al. 2017), while others include public authorities as part of community (Norris et al. 2008; Magis 2010; Cutter 2016; Kruse et al. 2017). Importantly, authorities that have

impact on a local community may be both internal and external to that community (Singh-Peterson et al. 2015).

When the understanding of community is linked to resilience, community resilience can be differentiated from the resilience at other scales, such as individual and national. Within communities, resilience is not only related to the resilience of individuals, but also interpersonal and collective relationships and capacities are a key part of community resilience (Kimhi 2016; Kulig & Botey 2016; Madsen & O'Mullan 2016). Similarly, collective capacities and competences within a specific community may increase both the resilience of communities and individuals (Kulig & Botey 2016). There may also be mismatches between scales, and some policies may increase community resilience but decrease individual resilience (Akamani & Hall 2019). Similar mismatches may occur between community and higher scales, for example, while specific FRM measures such as some flood defence infrastructures may be beneficial for one community, their impacts may be adverse for a larger basin area (Liao 2014).

Against the background presented above, we approach the configuration of communities in FRM as spatially, temporally and socially fluid. In accordance with this relational approach, we categorise community actors according to three degrees of formalisation: informal actors, civil society, and authorities. We locate the actors at three different geographical and administrative scales: local, regional, and national. Further, we use actor types and scales as our analytical tools to examine how the actors interact with each other in the study areas within the context of FRM. We illustrate actor type and scale as x- and y-axes respectively in sociograms, which have been widely used in social network analyses of community networks (Barrett et al. 2011; Tubaro et al. 2016; Giordano et al. 2017; Misra et al. 2017).

Materials and methods

Study areas

We studied two flood-prone areas in Finnish Lapland: Kittilä (Fig. 1), the main village in Kittilä Municipality (not shown in Fig. 1), and the residential area of Saarenkylä, a suburb located 3 km north-east of the centre of the city of Rovaniemi (Fig. 1). In 2018, Kittilä had 2800 inhabitants, Saarenkylä, had 7100 inhabitants, and Rovaniemi city as a whole had 60,000 inhabitants (Statistics Finland n.d.). We used a holistic, multiple-case design (Yin 2003, 39) to gain a better understanding of community resilience, while not aiming to compare the two study areas. Both study areas are among the potentially significant flood risk areas in Finland. The main flood threat occurs during spring, when the snow melts, with a usual flood peak in May. In 2005, Kittilä experienced a flood that that caused some of the greatest damage caused by floods in Finland since the start of the 21st century (Kemijoen tulvaryhmä et al. 2016), while Rovaniemi has one of the highest flood risks in Finland, in terms of potential economic losses and affected residents (Kemijoen tulvaryhmä et al. 2016). Both study areas are located in the River Kemijoki basin, which drains an area of 51,527 km^2 (Kemijoen tulvaryhmä et al. 2016).

The FRM in the study areas is governed by the same regional authorities and both areas are covered in the same six-year FRM plans in which the objectives and measures for FRM are listed. The most recent FRM plan, 'Kemijoen vesistöalueen tulvariskien hallintasuunnitelma vuosille 2016–2021', is for the period 2016–2021 and lists risk reduction measures such as land use planning, flood defence measures such as dams and dykes, preparedness measures such as flood forecasts, and actions during and after floods (Kemijoen tulvaryhmä et al. 2016).

The city of Rovaniemi (66°30'N, 25°44'E; 80 m a.s.l.) is located at the confluence of two major rivers (Kemijoki and its tributary Ounasjoki). The average flow of the Kemijoki at

Rovaniemi downstream of the confluence is 524 m^3 per second and the average maximum flow during spring floods is 2463 m^3/s (Kemijoen tulvaryhmä et al. 2016). Saarenkylä, an estimated that c.800 and c.2900 people live in the flood risk area of 100-year floods and 1000-year floods respectively (Kemijoen tulvaryhmä et al. 2016). Saarenkylä can be characterised as an upper middle-class neighbourhood with relatively high household median income and typical housing types are detached or terraced houses (Table 1). The most recent flood that caused notable damage in Saarenkylä was in 1993 and had a return period of 20 years and maximum flow of 4207 m^3/s (Kemijoen tulvaryhmä et al. 2016). The most recent major floods were in 1859 and 1910. It has been estimated that the 1859 flood had a return period of 250 years and floodwater was 2 m above the 1993 flood (Kemijoen tulvaryhmä et al. 2016). Since the 1950s, several hydropower dams have been constructed on the River Kemijoki, with two major reservoirs and one heavily regulated lake upstream of Rovaniemi. It has been estimated that with the dams in operation, the water height during floods could be cut by 0.5 m (Marttunen et al. 2004). There have been plans to construct a third major reservoir at a protected Natura 2000 site upstream of Rovaniemi and it has been estimated that the reservoir could cut flood heights by 1.5 m (Kemijoki Oy 2011). In January 2018 the Finnish Government decided that there were no possibilities to construct the reservoir on a Natura 2000 site and in April 2019 the government's decision was enforced by the Supreme Administrative Court of Finland (A. Räsänen, unpublished data).

Kittilä (67°39'N, 24°54'E; 175 m a.s.l.) is located on a low-lying area upstream of Rovaniemi, on the free-flowing River Ounasjoki. The average flow of the Ounasjoki upstream of Kittilä is 50 m^3/s and the average maximum flow during spring floods is 473 m^3/s. It has been estimated that 440 and 890 people live in the risk area of 100-year and 1000-year return period floods respectively (Kemijoen tulvaryhmä et al. 2016). In Kittilä, the income and education pattern of inhabitants is close to the country average (Table 1). The most recent

major flood occurred in 2005 and had a maximum flow of 844 m^3/s and a return period of 60–70 years (Kemijoen tulvaryhmä et al. 2016). The costs of the flood, which included damage to c.40 inhabited buildings, were estimated as c. EUR 6 million (Kemijoen tulvaryhmä et al. 2016). Since the 2005 flood, there have been plans to construct flood dykes to protect the main flood risk areas, but the dykes have not yet been constructed, mainly due to opposition from some landowners.

Methods

Mixed methods (Teddlie & Tashakkori 2009), including qualitative interviews, quantitative surveys, and policy document analysis were used to corroborate findings from multiple sources, to obtain a versatile in-depth view of the FRM and community resilience, and to complement the perceptions of different actors with official views recorded in policy documents. We mainly used qualitative data when sketching sociograms of actor networks (Tubaro et al. 2016), including integrating the visualisations into qualitative and quantitative analyses of the collected data. Interviews were conducted to gain insights into how different actors understood community and the roles of community, actors, and networks with regard to FRM. The purpose of the surveys was to gather a larger sample of local residents' perceptions of community and FRM actors, as well as any FRM measures the residents might have taken themselves. Policy documents were analysed to obtain an official view of the roles and networks of FRM actors.

In 2017 we carried out 31 semi-structured interviews with representatives of local and regional authorities, civil society actors, and residents in flood-risk areas (Table 2). Each interview lasted 15–90 minutes and most interviews were held with one interviewee, but in two cases there were two interviewees and in one case there were three interviewees. We had identified relevant authorities and civil society actors beforehand, and we asked the

interviewees to suggest further interviewees (on the snowball method, see e.g. Denscombe (2010)). Local residents were recruited by sending invitations to residential associations and through snowballing.

Four themes were in focus during the interviews: (1) flood memories and experiences, (2) actors and actions within FRM, (3) community, and (4) the relationships between different actors. Although we were interested in resilience related to floods, we decided not to use the word 'resilience' (*resilienssi* in Finnish) when conducting interviews because it is not widely used in Finnish language. The interviews were transcribed verbatim but some filler words were removed. The material was analysed using ATLAS.ti software (ATLAS.ti GmbH, Berlin, Germany) by following a thematic analysis framework developed by Braun & Clarke (2006). Initially, we read and reread the material, and then made initial decisions on what to search for. During these steps, we made the decision to focus on the different roles of community in FRM and therefore constructed a list of themes that could potentially be identified. Thereafter, we initially coded the data and then organised the coded data into themes. Lastly, we reviewed the themes. In our presentation of the interview results in this article we include a number of quotes from individual participants for illustration, while a larger set of quotes is included in Supplementary Appendix 1. All quotes in this article were translated from Finnish into English by the lead author, and the interviewees' anonymity has been preserved.

Additionally, we carried out a household survey in the study areas during autumn 2017, which targeted local residents living in flood risk areas (Table 2). The survey was carried out to reduce bias in the interviewee selection process and to obtain a larger sample of local residents. We sent 1821 invitations by post to one adult member in each household living within the 1000-year flood risk zone in each of the study areas (Saarenkylä and Kittilä), and the invitation letter included a link to an online survey. As the response rate was low (7%)

(Table 2), especially in the case of Kittilä, we did not consider the survey results statistically representative. Therefore, they were used rather as supplementary data for the qualitative interviews. The survey questions were formulated so that the data would complement and corroborate data gathered in interviews.

The survey included questions about how the residents perceived flood risks (how probable they considered that 50-year or 250-year floods would occur Saarenkylä/Kittilä and how worried they were about floods), their understanding of how their community worked (questions about community structure, place attachment, local knowledge, relationships with each other in the community, and neighbourhood assistance), who were the main actors responsible for flood preparedness, whether they considered FRM successful in the study area, whether the residents were prepared for floods, what were their preferred FRM solutions, how and from where they gathered flood-related information, and their flood experiences (the survey questions and a summary of the answers are provided in Supplementary Appendix 2). When reporting the survey results, we treated the responses from both study areas jointly for the most part. Due to the low response rates and low cross-site variation, we avoided deriving statistical inferences. The low response rate can potentially be explained by a participants' lack of possibility to respond via traditional post, lack of reminders, and survey fatigue.

In addition to the interviews and surveys, we reviewed a number of key policy documents (including Kemijoen tulvaryhmä et al. 2016; ELY 2017) and official institutional material relating to FRM. We initially analysed the documents before the interviews and surveys to gain an in-depth overview of the FRM in the study areas, which helped when formulating interview and survey questions. However, the final analysis was carried out after the empirical data had been acquired. The key document was the FRM plan for the Kemijoki basin area for the period 2016–2021 (Kemijoen tulvaryhmä et al. 2016), its appendices,

written feedback by different authorities, civil society organisations, and individuals, including responses to the feedback, as well as a guide to flood self-preparedness targeted at local inhabitants (ELY 2017).

Results

Understanding community

Two distinct but overlapping types of community were identified from the interviews: the *immediate social community* and the *local community*. The former consisted of friends and relatives who did not necessarily live in the same geographical area or town. By contrast, the interviewees commonly described the local community as either a residential area (in the case of Saarenkylä) or a village (in the case of Kittilä). The two community concepts were then used in the survey questions. In the survey responses, local community was mainly related to a specific place, and included neighbours and other people living nearby, and to a lesser extent civil society or authorities (Fig. 2), while the immediate social community consisted primarily of friends, family members, relatives, and neighbours.

Key actors and their responsibilities in flood risk management

According to the policy documents, the most important actors in Finnish FRM were the regional environmental administration centres (Centres for Economic Development, Transport and the Environment, also known as ELY Centres) and the fire and rescue services, which can be categorised as regional authorities (Table 3). The regional environmental administration coordinates the institutional interplay in flood preparedness and is the leading expert in FRM. Fire and rescue services lead the practical work during floods. Municipalities, private companies and local inhabitants are responsible for flood protection of their own properties. Municipalities also provide response and recovery assistance to local residents (e.g. in the

form of health and social services). The preparation of the six-year FRM plans is coordinated by the Ministry for Agriculture and Forestry, the Regional Councils, and regional environmental administration centres.

In the FRM plan for the Kemijoki basin area (Kemijoen tulvaryhmä et al. 2016), informal or organizational actors are assigned very limited role. Local self-preparedness is emphasised as important, while the plan is mainly concentrated on the role of institutional actors and other FRM measures. Also, in the interviews, a number of the representatives of authorities highlighted the importance of self-preparedness: 'The municipality does not take the responsibility. It is the responsibility of the owner of each building to protect her/his own building' (Interviewee, local authority).

In the survey, local residents regarded local and regional authorities as having the main responsibility for FRM (Fig. 3). When asked about self-preparedness against floods, 33% of the survey participants considered they were well prepared or fairly well prepared, while 55% considered their state of preparedness as bad or fairly bad. Furthermore, only 24% of the participants knew that their insurance covered flood damage, while the remaining 76% either knew that they were not insured (31%) or did not know whether they were insured (45%). A total of 63% of the participants considered their own preparedness measures either important or fairly important, but they regarded other flood preparedness measures and communication by authorities as more important.

Roles of community

From the results presented above, in the sections 'Understanding community' and 'Key actors and their responsibilities in flood risk management', our preliminary conclusions are that community was mainly understood as composed of informal actors, whereas FRM was perceived as led by different authorities, leaving only a marginal role for community in FRM

or flood resilience. However, based on the thematic analysis of our semi-structured interview data, we identify three themes that include different roles of a community in FRM. In all three themes presented in the following sections, actions related to FRM are taken by different actors across the three scales, which makes a simple delineation of community very challenging.

Community members working together for a common goal

Each spring, authorities in both study areas prepare for floods. The interviewed representatives of the authorities described how the flood preparedness network formed by the regional environmental administration centre for Lapland (Lapin elinkeino-, liikenne- ja ympäristökeskus, the ELY Centre for Lapland), fire and rescue services, municipalities, National Flood Centre, and Kemijoki Oy (Fig. 4[1]) was the only forum for systematic cooperation in disaster risk management:

> The annual build-up of flood protection organisation serves also the purpose that we have a network maintained all the time, and the network can be used also in other kinds of disaster situations. (Interviewee, regional authority)

The authorities that participate in the networks range from local to national (Fig. 4), but the role of other actors is very limited in those networks:

> Not everyone can be in personal contact [with the authorities], because then we would hinder administrative work. (Interviewee, local civil society actor)

[1] For descriptions of the actors shown in Fig. 4, see Table 3.

However, without exception, the interviewed representatives of the authorities and civil society actors variously described the cooperation as good to excellent by emphasising examples of regional characteristics:

> Lapland has this good feature that there are few actors and all know each other. So, cooperation is normal here. (Interviewee, regional civil society actor)

Although the role of civil society and informal actors is limited in annual flood preparedness activities, the different types of interviewees described how the village community came together during a major flood in Kittilä in 2005 (Fig. 4). Many interviewees described how different actors, including authorities at different administrative levels, civil society and informal actors (Fig. 4) had worked together, and helped each other during the crisis. In addition, informal help had been offered from outside Kittilä:

> The village inhabitants were helping day and night. One carried coffee pots or thermos flasks in a wheelbarrow and brought [them] to the soldiers so they could eat and drink. (Interviewee, local civil society actor)

> Several acquaintances from farther south or north have said that if there is a situation, 'call', and they will help. (Interviewee, local resident)

Various interviewees also described that it was in the common interest to suffer as little damage as possible, which could be ensured through institutional preparedness for annual flooding and by taking action during a flood:

> All of us in these flood risk areas concentrate on the flood being as painless as possible. (Interviewee, regional authority)

Similar results were also obtained from the survey targeted at local residents: 91% fully or partially agreed that the possibility of a flood would bring the residents together and that they would help each other.

Community as an arena for conflicts and tensions

There was evidence of conflicts in both study areas (Fig. 5[2]). The majority of the conflicts took the form of disagreements over flood defence measures. Although there have been plans to construct flood dykes in both Kittilä and Saarenkylä, the plans have not been realised due to opposition, mainly from local residents and landowners. In Kittilä, some interviewees speculated that the conflicts were not rooted in the flood defence solutions:

> Somehow, I feel almost certainly that it is not the construction of the dykes but personal relationships. (Interviewee, regional authority)

In Saarenkylä, Rovaniemi city authority, the Regional Council of Lapland, the majority of the inhabitants in the flood risk areas, and the homeowners association all lobbied to build a reservoir in a nature conservation area upstream on the River Kemijoki in order to regulate the amount of water in the river. According to some of actors who opposed the lobby, many of the aforementioned actors worked in tandem; for instance, a few retired employees of the Regional Council of Lapland were active in the homeowners association (Saarenkylän

[2] For descriptions of the actors shown in Fig. 5, see Table 3.

omakotiyhdistys). Some interviewees even described how the dam operating company Kemijoki Oy was part of the lobby, although it did not have an official view on the reservoir:

> It is understandable that the company, which has the role of producing electricity, is driving a project with which it could catch also the rest [of the potential hydropower]. (Interviewee, regional authority)

Some of the interviewees maintained that the reservoir and FRM were very closely linked. Furthermore, when asked about flood risks, some interviewees immediately started to talk about the reservoir, while for others, FRM and the construction of the reservoir seemed to be one and the same issue. A number of interviewed local residents described how the whole community in Saarenkylä had a common opinion: all residents were in favour of the reservoir and opposed to the construction of flood dykes. For instance, one local resident argued, 'Everybody thinks that it [the reservoir] should, of course, be done.' Many interviewed residents in Saarenkylä, civil society actors and representatives of authorities described how there was a uniform community proposing only one solution for the FRM: the reservoir. Therefore, it can be reasoned that both the community and FRM were configured through the lobbying.

The primary lobbying targets of the reservoir proponents were politicians at both local and national scales, as well as upstream municipalities, most of which were against the reservoir (Fig. 5). Lobbying actions were carried out in different ways, such as letters sent to politicians and the press. Some opponents of the reservoir described how the long-term lobbying had affected popular opinion in Saarenkylä:

> There has been so much erroneous writing in the letters to the editor by the residential associations that are worried about floods. (Interviewee, regional civil society actor)

Particularly, the regional environmental administration centre for Lapland, environmental civil society organisations (e.g. the Finnish Association for Nature Conservation), and many upstream inhabitants were against the reservoir and in favour of the dykes (Fig. 5). According to the survey results for Saarenkylä, 73% of the participants were in favour of the reservoir and 41% thought that dykes should be built. By contrast, 17% were opposed to the reservoir and 51% were opposed to the building of dykes. Similarly, the open answers in the survey revealed that many participants had strong opinions about the reservoir. Some of the interviewed representatives of authorities and civil society actors argued that the lobbying for the reservoir and the wrangle about the flood defence measures had shifted the focus away from flood preparedness and that alternative solutions had not been considered. Some interviewed representatives of authorities even highlighted that people appeared to not worry about floods because they did not want to prepare for them and were only willing to have the reservoir built:

> When it is said that some permanent structures are built in Saarenkylä that affect their environment [...] the ones who are against these issues are more prominent and start to work. From this, I think that people do not consider the risk being high. (Interviewee, regional authority)

Additionally, during previous flooding events. tensions had occurred between local residents, between various authorities, and between the municipality and local residents. Although many local inhabitants described how they had received a lot of help, some were more sceptical and said that despite hoping for help, they had received extremely little help from other people or the authorities. The situation during a flood in Saarenkylä in 1993 was described as follows:

> The municipality […] raised the road, which is on the other side of the house. They raised the embankment half a metre and besieged me. (Interviewee, local resident)

According to several interviewees, there was also disillusionment among informal and formal actors before the major flood in Kittilä in 2005, as few of them trusted the warnings given by the local head of the fire department and some were reluctant to take any flood preparedness measures. The municipal employees described how there was tension between different actors, such as when pumps were distributed from the fire station:

> So, we started to transport them to the home for the elderly in a trailer [...] but they [local inhabitants] took the pumps from a moving car. (Interviewee, local authority)

Furthermore, tensions within communities were evident from the survey results, as the FRM measures taken by different actors were not widely appreciated (Fig. 6[3]).

Community as a forum for information and knowledge dissemination

In the survey, 93% of the participants regarded communication prior to expected flooding as either an important or fairly important flood preparedness measure. Based on the interview material, the flows of information were mainly directed from the authorities to local residents (Fig. 7). Media, such as regional radio, and local and regional newspapers, were important mediators in the flow of information between authorities and informal actors (Fig. 7[4]). However, some authorities were slightly concerned about how the media worked:

[3] For descriptions of the actors shown in Fig. 6, see Table 3.
[4] For descriptions of the actors shown in Fig. 7, see Table 3

> The media are interested in the development of the flood each spring. It could be said that every spring […] some actors [the media] try intentionally to frighten people about floods. (Interviewee, local authority)

Additionally, the authorities provided information about floods (Fig. 7), for example, through official releases, and the interviewees highlighted that in the event on an emergency the fire department informed every household about that emergency. Some interviewees also described how volunteer fire departments and residential associations were important providers of information (Fig. 7). Most of the local residents were well aware of the flood risks, and 64% of the survey participants considered that flood awareness was managed well or fairly well in the study areas. The survey participants were moderately worried about floods. Of the participants who stated that they lived in a 50-year flood risk zone, 67% were worried about their home and 85% about Kittilä or Saarenkylä more broadly. Also, a number of interviewees described how floods had been widely discussed with their friends, relatives, and neighbours (Fig. 7), especially during spring. Some interviewees described their common fear, and one such interviewee stated:

> We all are in the same situation as I am. Everybody ponders that, if a flood comes, from where they will get the safeguards. Everybody feels this fear in Saarenkylä. (Interviewee, local resident)

However, some interviewed representatives of authorities argued that many inhabitants did not care much about the floods and few of them were interested in flood-related information:

> This flood issue is not really interesting for the people in Kittilä. There has been a very small group that has been interested. There are few people attending the meetings that have been held there. (Interviewee, regional authority)

In addition, information is disseminated between the authorities. The National Flood Centre provides flood forecasts for other authorities, whereas the regional environmental administration centre for Lapland and Kemijoki Oy provide information about local and regional conditions to the National Flood Centre (Fig. 7). Furthermore, there is a continuous flow of information between the authorities across all three administrative scales each spring, when preparations are being made for potential floods (Figs. 4 and 7).

The results revealed that the residents had communicated information and knowledge to authorities, and that private companies that provided services for the authorities also informed the authorities about local conditions (Fig. 7). The representatives of authorities involved in FRM said that the authorities received relatively little information from the local residents and companies, but they would use all knowledge they had. By contrast, former employees of the authorities described how the local residents had provided local knowledge to the authorities, as exemplified by the use of old photographs of previous floods that had been collected in Saarenkylä in the 1980s:

> Local residents had those [old photographs]. So, we had a few photo enthusiasts who collected them. We looked at them and made some kinds of maps. The first maps were quite simple but good for the purpose. (Interviewee, local authority)

Additionally, some interviewees highlighted that older houses in Kittilä and Saarenkylä had been built higher up on the riverbanks at times when people knew that flooding could occur.

However, this local knowledge had not materialised in local public planning, as building on flood risk areas had happened in both study areas.

Discussion

Through our presentation of the identified three themes that included different roles of a community in FRM, we have shown how a community can bes configured in different ways depending on the understandings and aims of FRM. Although civil society and informal actors were the focal point in some of the roles of community in the two study areas, in certain situations, regional authorities can be seen as also having been part of the community networks. Our analysis has shown the fuzzy, elusive, and situated faces of community. The way the actors were connected through networks (visualised in sociograms) (Figs. 4, 5 and 7) highlights the fact that firm and fixed organisational or spatial boundaries cannot be drawn around a community. Additionally, the identified three different themes show that there are multiple types of communities and community formation processes within a local society. Moreover, the themes suggest that the processes of community configuration can both increase and decrease community resilience to floods.

Configurations of community

According to our results, the place-based, single-scale understanding of community is misleading in the case of FRM because in a social system such as FRM, there are interactions across scales (Berkes & Ross 2016; Maclean et al. 2017) that make the identification of a spatially specific (i.e. local) community impossible. Therefore, in line with Mulligan et al. (2016), we argue that understanding the configuration of community should include both an understanding of multiple interacting layers or scales and analysis of the interactions and roles

of different administrative and geographical scales (Singh-Peterson et al. 2015; Berkes & Ross 2016).

Authorities are main actors in FRM, and their responsibilities are often divided across administrative scales, as in the case of FRM in European countries (Fournier et al. 2016; Priest et al. 2016). Therefore, authorities should be included in the definition of community if the intention is to include the most relevant actors related to FRM. Furthermore, when authorities are included in the definition of community, it is difficult to draw clear boundaries around a community.

Alternatively, community can be confined to either local informal or civil society actors, as suggested by the results of previous research (e.g. Patterson et al. 2010; Coates 2015). However, in this perspective too, there are inevitably interactions across scales. Civil society organisations operate at both regional and national scales, as in the case of the Finnish Association for Nature Conservation, or they can have established links to actors at regional and national scale, as in the case of the Saarenkylä homeowners association or volunteer fire departments. Moreover, our results imply that the immediate social communities of local residents are not bound to a specific place, which has been suggested also in previous studies (Ojha et al. 2016; Pauwelussen 2016). Additionally, our results show that the actor networks extend beyond different actor types, and in some situations, such as when some of the actors are lobbying for specific flood defence measures, the different actor types are tightly intertwined.

In addition to the fluid spatial, scalar and social boundaries of communities, our results show that communities change, depending on the stage of the risk cycle (Barrios 2014; Misra et al. 2017). In the theme of community members working together for a common goal, we have shown how flood preparedness was managed almost solely by the authorities in the two studied areas, but in response and recovery stages, civil society actors and local residents

played a more prominent role. Moreover, the most important authorities and their networks were different at different stages, with regional environmental administration centre for Lapland having main responsibility for preparedness, fire and rescue services for response, and municipalities for recovery.

Resilience of community

Our results highlighted variations in how the different actors perceived their roles in FRM. Most significantly, the interviewed representatives of several authorities highlighted the importance of self-preparedness, yet local residents who participated in survey and in the interviews thought that their own role was not important for FRM. From a resilience perspective, it can be argued that self-preparedness against floods increases individual resilience but not community resilience, whereas authority-led FRM primarily increases community resilience and might even decrease individual resilience, as shown in the example of how the temporary raising of a road besieged a detached house. Thus, the local residents' resistance against self-preparedness might seem contradictory. However, their resistance also touched on resources and tradition. Self-preparedness would require financial and other resources from the local residents, who have traditionally relied on the strong Finnish welfare state (e.g. Rapeli et al. 2018).

In Finland, the emphasis on self-preparedness is quite recent and is related to the reformation of flood damage compensation from public to private insurance that took place in 2014 (Väisänen et al. 2016). Therefore, perceptions of responsibilities might be slowly changing and local residents might take a stronger role in future. However, from the perspective of community resilience, the authorities' emphasis on individual self-preparedness could be accompanied by a focus on community self-preparedness (i.e. how

local residents and other actors could increase their preparedness and resilience together in a participatory manner).

Participatory approaches to FRM with diversified actor set-ups have been applied and studied for some time. For example, it has been argued that participatory approaches, open and transparent public processes, and diversification of FRM actors are needed to achieve more resilient FRM (Maskrey et al. 2019; Tyler et al. 2019). Furthermore, it has been claimed that participatory processes increase risk awareness, local residents' preparedness, the use of multiple types of knowledge, legitimation of FRM, and community capacities, especially the social ones (Maskrey et al. 2019; Tyler et al. 2019), and decrease disparities and conflicts (Alexander et al. 2018; Otto et al. 2018). However, evidence from participatory processes has also shown that often expectations are not met. Instead, participatory approaches may lead to an illusion of participation in which local residents do not have a fair say in FRM planning, and in responsibilisation (i.e. processes of shifting FRM preparedness responsibility from public actors to private actors (Moon et al. 2017; Begg 2018)). Therefore, in participatory FRM, the responsibilities of local residents may increase but their power in FRM decisions may not.

Participatory FRM can be regarded as a new type of governance arrangement but also as a driver for community construction (Moon et al. 2017; Begg 2018). It can be argued that participatory approaches aim to engage community (i.e. local informal actors) in decision-making or that participatory approaches construct new types of communities that include both informal actors and authorities. With respect to the community configuration, some critical remarks can be made (Moon et al. 2017; Begg 2018). Previous research has argued that more local stakeholder involvement could increase disparities by giving more resources and power to the actors who already have capacities such as knowledge, social capital, and funds, and could leave less powerful actors worse off (Moon et al. 2017; Begg 2018). Hence, the

individual resilience of some local residents, such as marginalised residents with high vulnerability, could be lower in a participatory FRM, although the overall community resilience could be higher. Furthermore, the participatory FRM could construct a new type of FRM community in which some local residents and actors may be left out and others could have a more prominent role. It could thus be argued that the participatory FRM could change the community and its power constellations especially in the preparedness stage. In future research, it would be interesting to look at whether flood response and recovery communities are different when participatory FRM arrangements are compared with more traditional governance arrangements, including the implications for individual and community resilience and social justice.

Communities of practice in flood risk management

Some of the following identified themes can be linked to the term 'community of practice' (Wenger 2000). A community of practice can be identified especially in the case of lobbying for the reservoir in Saarenkylä (within the theme 'community as an arena for conflicts and tensions'). Different actors engaged in lobbying for the reservoir aligned their efforts and as a consequence their lobbying was effective, and some actors even imagined that the whole community, or more specifically, 'community field' (cf. Wilkinson 1991), supported the construction of the reservoir. However, not everyone in Saarenkylä shared this view; thus, the lobby left many actors out of the perceived community. A community of practice, such as the lobby, may be detrimental to resilience. As highlighted by some of the interviewed representatives of authority and civil society actors, the lobbying for one preferred FRM measure (i.e. the reservoir), which was considered as being the final solution for FRM, drew attention away from other FRM actions and led to increased conflicts. In essence, the lobbying revealed the power politics within the community (Agrawal & Gibson 1999) and

demonstrated how different interests as well as internal and external influences affected community coherence and formation.

In addition, when members of a community work together for a common goal, a community of practice can be identified. In such cases, a community is primarily configured around authorities, which engage in FRM jointly and align their activities through administrative cooperation. The community will differ strikingly from the perceived local community and immediate social community. In this case, local community's resilience against floods would probably be more dependent on the authorities' actions and measures, and less dependent on arrangements within perceived local and immediate social communities. Previously, areas of cooperation and agreement, evident in the theme of 'community members working together for a common goal', could be linked to social networks, which have been argued as integral to community resilience (Norris et al. 2008; Magis 2010; Cutter 2016). While some researchers have found a positive relationship between strong ties between people (part of social capital) and resilience (Hawkins & Maurer 2010; Boon 2014; Madsen & O'Mullan 2016), others have reported that the social structure (e.g. socioeconomic status and population composition) of communities plays a larger role (Wickes et al. 2015). Our results indicate that during flood response, actor networks should include different actor types, as has been suggested previously (Giordano et al. 2017; Sayers et al. 2018), but we cannot judge whether more participatory flood preparedness or higher social capital would increase resilience.

Conclusions

We have analysed interviews, surveys, and policy documents gathered in two flood prone areas in Finnish Lapland to understand how community can be configured and what roles community has in FRM and in relation to flood resilience. The results show that regional

authorities are the most important actors in FRM. There seem to be few roles for civil society and local informal actors, who are usually perceived as more important in both the place-based understanding of local community and the interaction-based immediate social community. Furthermore, in the studied areas there were divergences between the actors in how they perceive their roles in FRM: in particular, authorities emphasised self-preparedness, while local residents did not consider their role as being important. However, the different types of actors were tightly coupled in networks of FRM related to cooperation, disagreement, and communication. Therefore, community was configured differently for different purposes, and one cannot confine community to informal actors at the local scale. Thus, any analysis of communities and their resilience should not be limited to the local scale, but should include relevant actors across scales, as there are notable cross-scale interactions.

Analyses and visualisation of community networks help us to understand how a community works and how it takes shape in divergent settings. There are multiple roles of community within FRM, and the different roles have divergent implications for how community forms and functions. Finally, our results indicate that informal actors, civil society, and authorities are important to flood resilience, but the mechanisms regulating how different actors, different scales, and community configuration processes increase or decrease the resilience are still not well understood. Therefore, more research should be devoted to analysing how different actors and scales of community interact and what kind of interactions, networks and governance arrangements would be most beneficial in relation to flood resilience.

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Table 1. Key socio-economic statistics for Finland and study areas.

	Population	Average age	Household median income (€)	Employment rate (%)	Proportion of adult population with post-comprehensive level educational qualification (%)	Proportion of dwellings in small houses (i.e. other than blocks of flats) (%)
Finland	5,503,297	42	31 824	66.9	75.0	53.2
Saarenkylä	7,110	40	44 105	73.9	82.4	94.6
Kittilä	2,783	43	32 379	72.1	75.8	81.8

Table 2. Details of interviews and surveys

Method	Details		Saarenkylä (including regional authorities)	Kittilä	Total or average
Interviews	Number of interviews (including Written answers)		18*	13**	31
	Number of interviewees (including Written answers)		20	15	35
	Details of the interviewees:				
		Local and regional authorities	12	6	18
		Civil society actors	4	3	7
		Flood-risk area residents	4	6	10
		Males	16	8	24
		Females	4	7	11
		Approximate average age)***	57	63	61
	Time of the interviews		8 June – 10 July 2017	22–26 May 2017	
Surveys	Invitations		1220	601	1821
	Responses		104	26	130
	Response rate (%)		9	4	7
	Male responses		72	10	82
	Female responses		31	16	47
	Gender not revealed		1	0	1
	Average age		57	54	56
	Letters sent		9–14 November 2017		
	Deadline for responses		30 November 2017		

Notes: *including one phone interview and one written answer; **including one written answer; *** (not all interviewees revealed their exact age

Table 3. Main actors and their roles in the flood risk management in Kittilä and Saarenkylä (Sources: Kemijoen tulvaryhmä et al. (2016), ELY (2017), and interviews

Actor	Scale	Actor type	Role
National Flood Centre (Tulvakeskus)	National	Authority	Develops the flood forecasts
Ministry of Agriculture and Forestry	National	Authority	Coordinates the preparation of flood risk management plans at the national scale
Regional environmental administration centre (ELY Centre for Lapland)	Regional	Authority	Coordinates institutional interplay in flood preparedness; leading expert on flood risk management; prepares flood risk management plans with the regional council; provides expert assistance and information to fire and rescue services, local residents, municipalities, and private actors; develops the flood forecasts with the National Flood Centre; plans the operation of the dams together with the dam operating company Kemijoki Oy
Fire and rescue services	Regional	Authority	Lead the practical flood protection with help from the contract fire brigade (in Kittilä) and volunteer fire and rescue service (in Saarenkylä), the police, defence forces, municipalities, volunteers, and private companies; provides information and help to the local residents; provides help in recovery phase
Police	Regional	Authority	Safeguard public order and security during floods
Defence forces	Regional	Authority	Assist and help in flood protection
Kemijoki Oy	Regional	Authority	Operates the dams on the River Kemijoki
Regional Council of Lapland	Regional	Authority	Prepares FRM plans together with regional environmental administration
Lapland Rescue Association (Lapin pelastusliitto)	Regional	Civil society	Educates volunteer fire brigade actors; provides information to local residents
Municipalities	Local	Authority	Responsible for flood protection on their own properties; assist in overall flood protection; help local residents with response and recovery; responsible for land use planning
Contract fire brigade	Local	Civil society	Assists in flood protection; has a considerable role in Kittilä, where there are only a few professional firefighters
Volunteer fire brigade	Local	Civil society	Assists in flood protection
Voluntary rescue services	Local	Civil society	Assist in flood response and recovery
Residential associations	Local	Civil society	Form a link between local residents and fire and rescue services; provide information to local residents; act as forums for cooperation for local residents
Private companies	Local	Informal	Provide services for fire and rescue services, regional environmental administration and municipalities; responsible for flood protection on their own properties
Local inhabitants	Local	Informal	Responsible for flood protection on their own properties

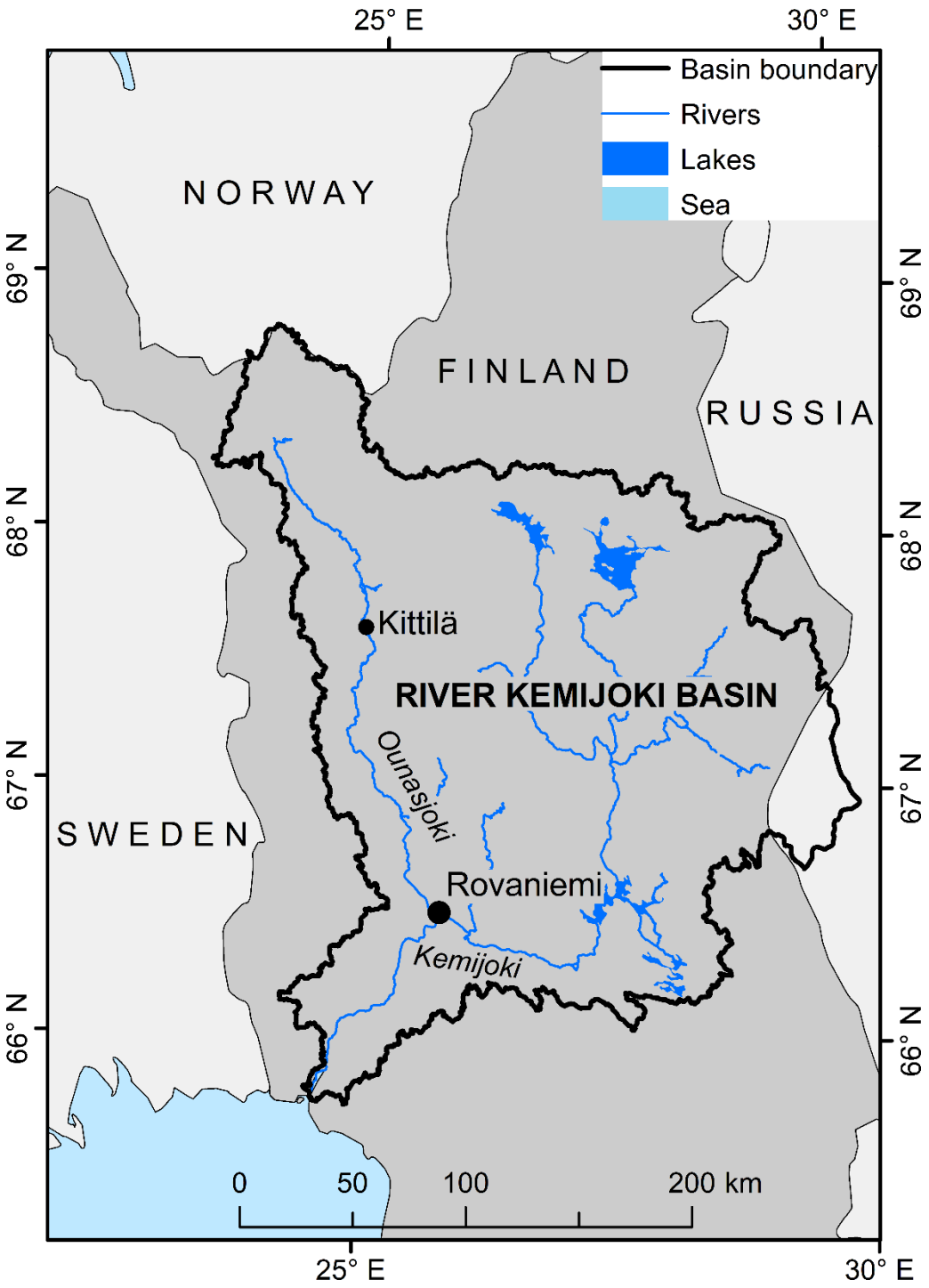

Fig. 1. Location of case study areas in northern Finland

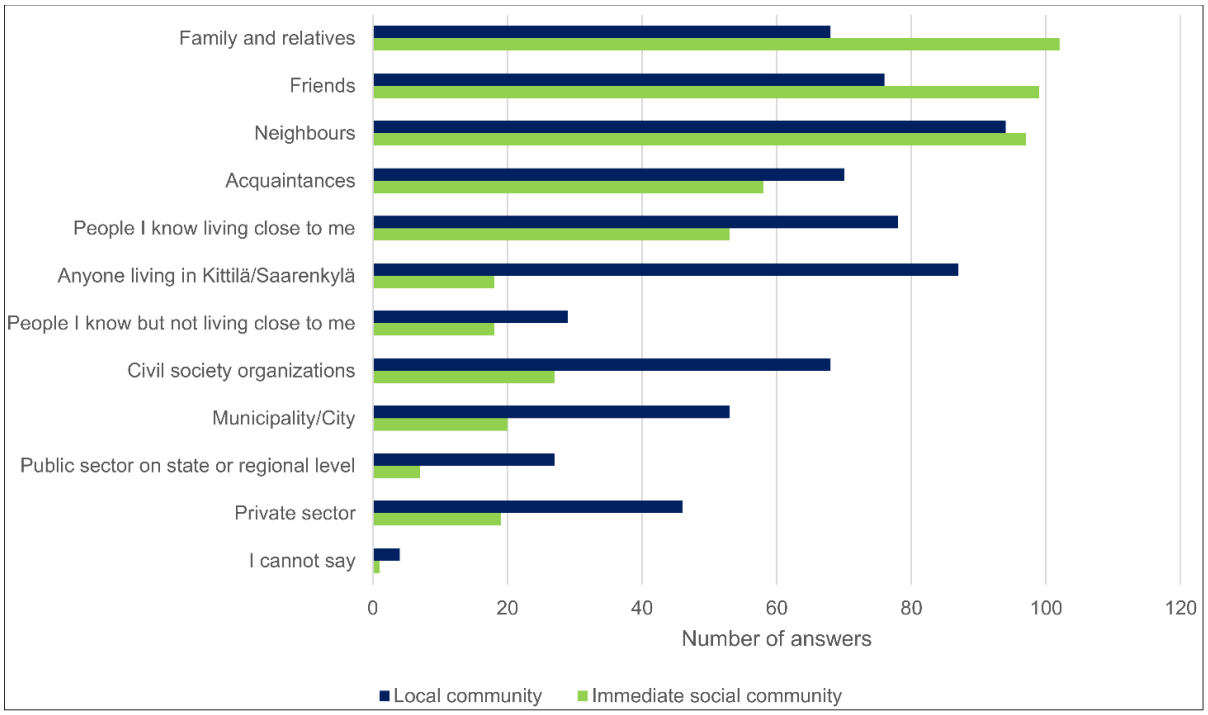

Fig. 2. Number of answers to the survey questions: 'In your opinion, which of the following people/actors belong to the local community in Kittilä/Saarenkylä?' and 'In your opinion, which of the following people/actors belong to your immediate social community?' (multiple responses possible)

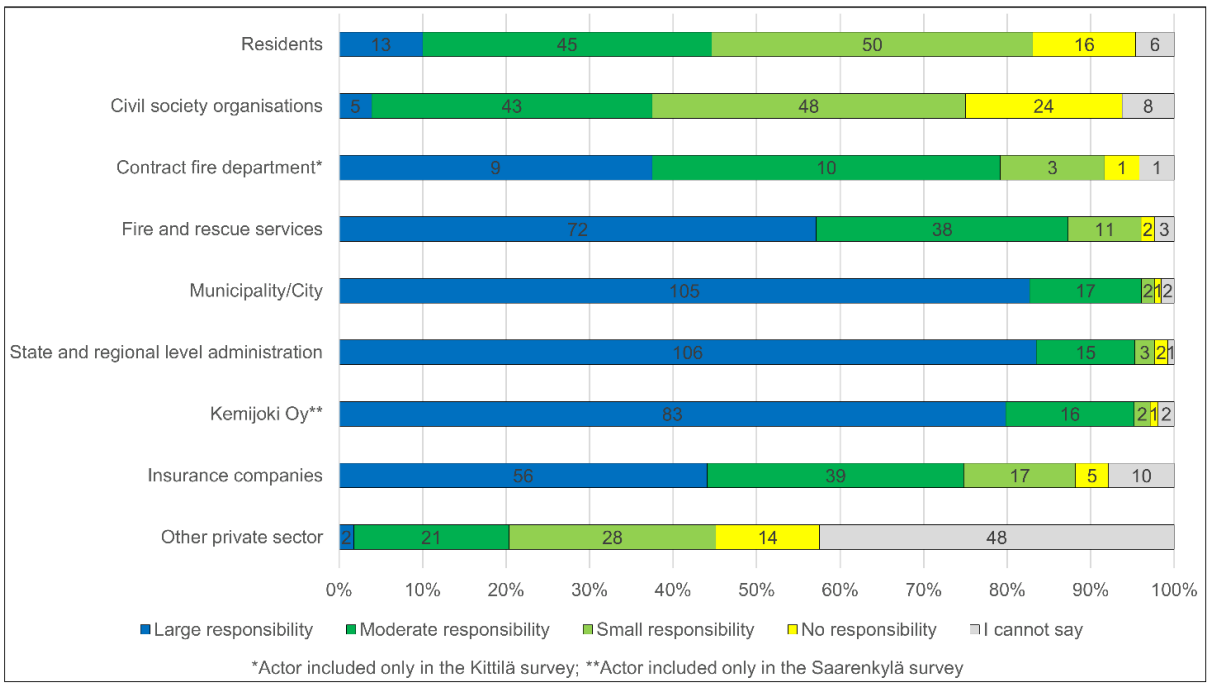

Fig. 3. Frequencies of responses to survey question 'In your opinion, how much responsibility do the following actors have for reducing the flood risks and their impacts?'

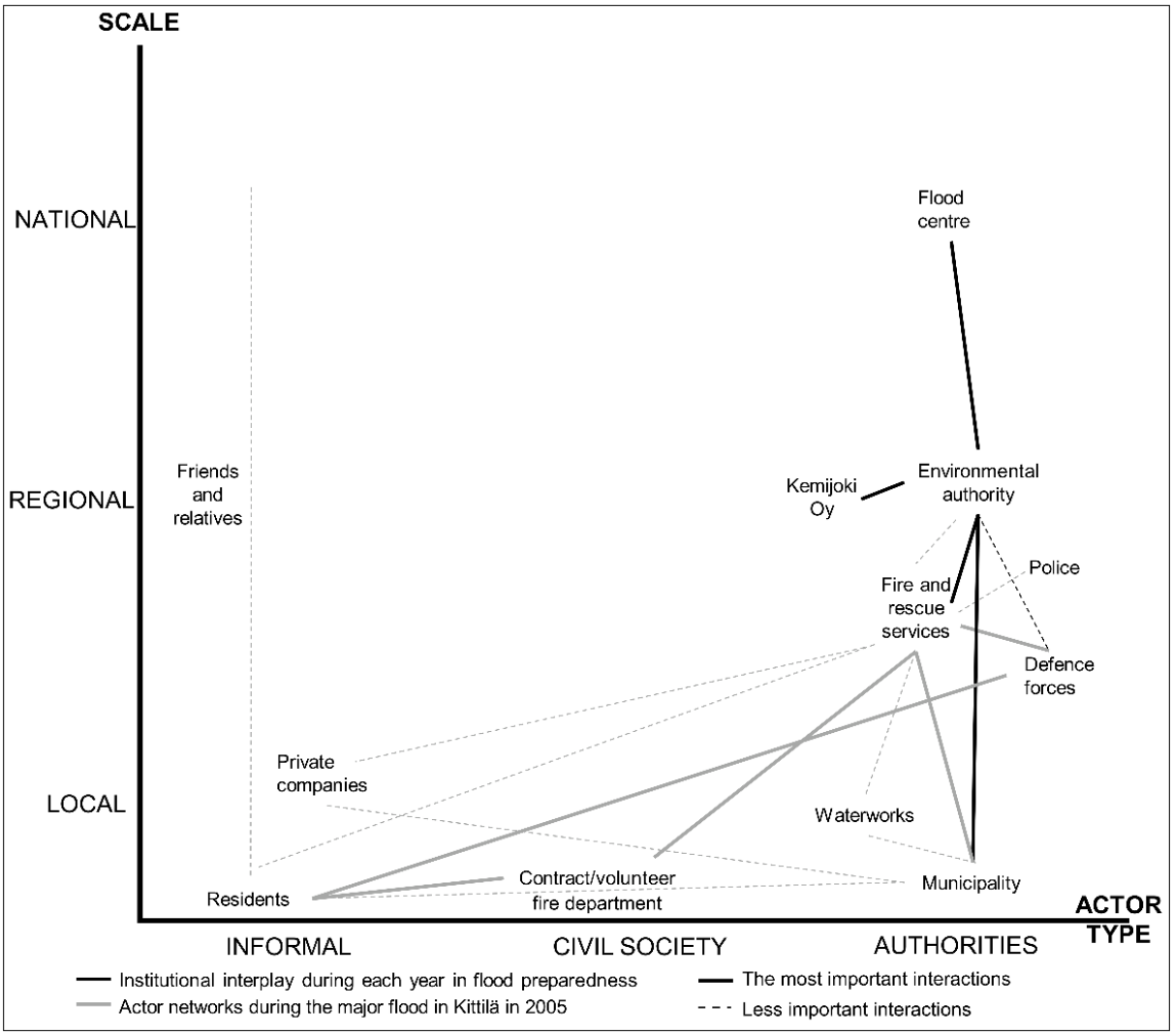

Fig. 4. Configuration of a community when the members work together for a common goal; the most important interactions are shown with thick lines and less important interactions with thin dashed lines

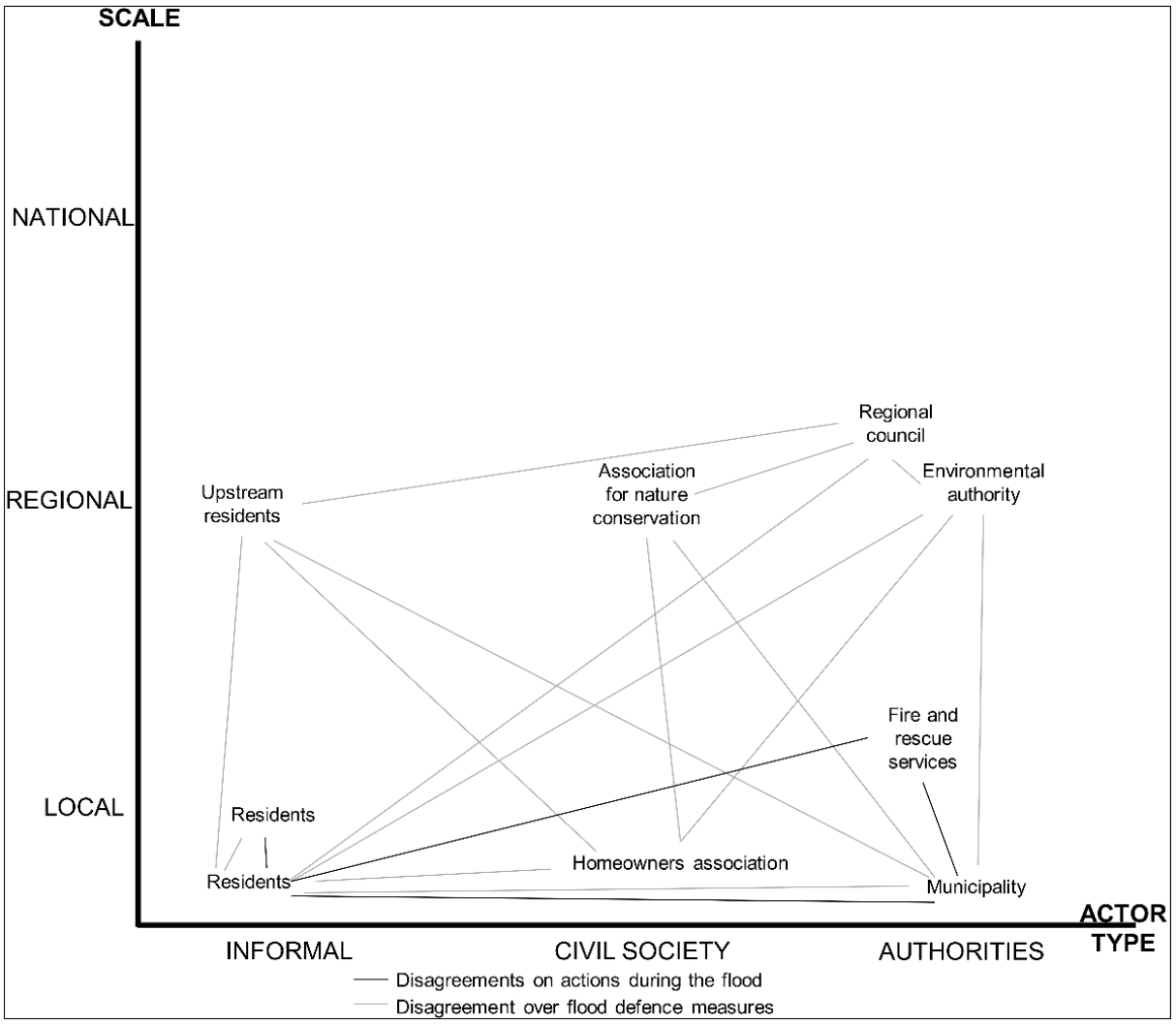

Fig. 5. Configuration of communities with conflicts and tensions, with tensions shown by lines

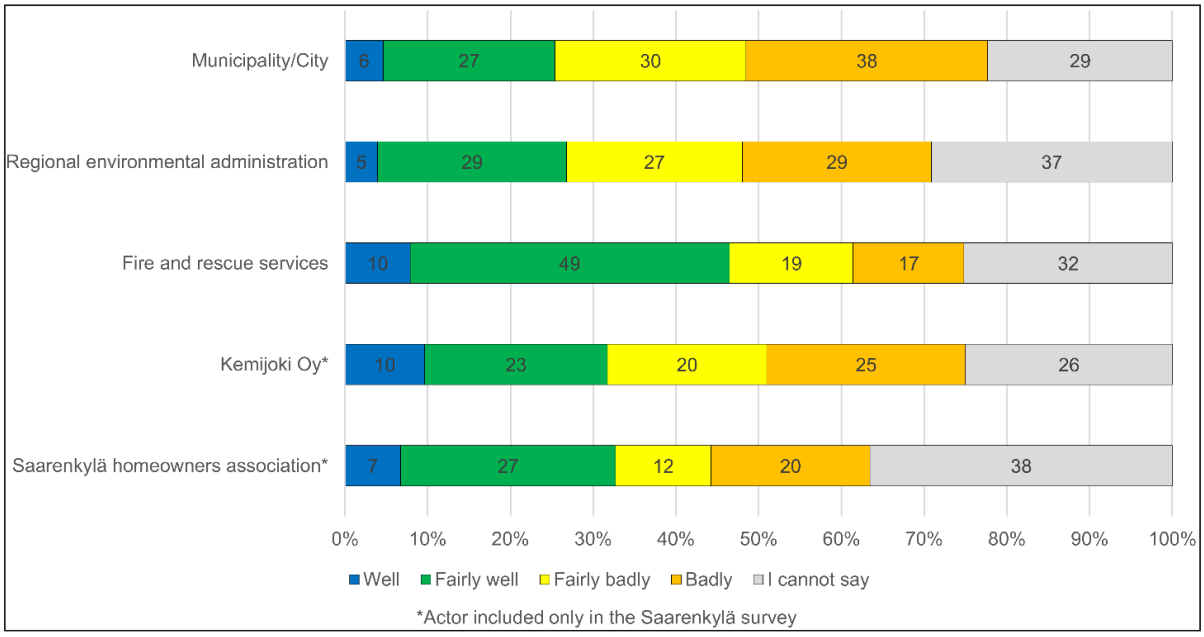

Fig. 6. Frequencies of responses to the survey question 'How do you feel the following parties have handled flood matters?'

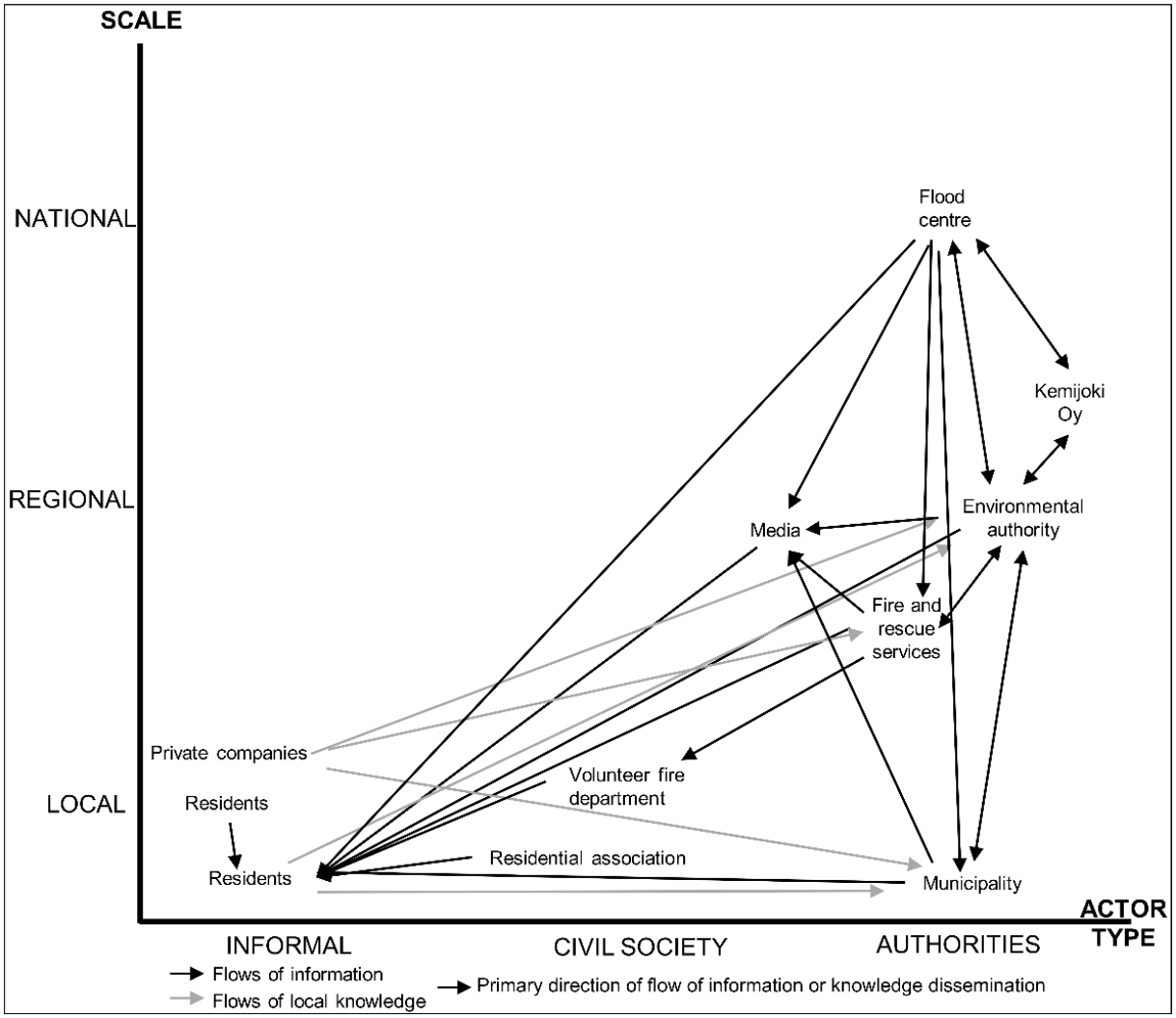

Fig. 7. Primary flows of information and local knowledge, when a community was seen as a forum for information and knowledge dissemination